

QUANTIFYING THE FINANCIAL IMPACT OF OCCUPATIONAL INJURIES AND  
ILLNESSES, AND THE COSTS AND BENEFITS ASSOCIATED WITH AN  
ERGONOMIC RISK CONTROL INTERVENTION WITHIN THE UNIPRISE  
BUSINESS SEGMENT OF UNITEDHEALTH GROUP

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ABSTRACT

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<p style="text-align: center;">QUANTIFYING THE IMPACT OF OCCUPATIONAL INJURIES AND ILLNESSES, AND THE COSTS AND BENEFITS ASSOCIATED WITH AN ERGONOMIC RISK COTNROL INTERVENTION WITHIN THE UNIPRISE BUSINESS SEGMENT OF UNITEDHEALTH GROUP</p>			
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The Uniprise business segment within UnitedHealth Group has experienced considerable direct costs associated with occupational injuries that have impacted overall profitability since 1999, with 44% of the total cost driven by cumulative trauma disorder. A clear, standardized method of quantifying the financial impact of injury is critical to effectively propose and gain support for a risk control initiative focused on the reduction of cumulative trauma injuries within Uniprise. Currently, UnitedHealth Group has neither a formal system to effectively quantify direct costs associated with occupational injury and illness nor a formal financial model to estimate the costs and benefits associated with risk control initiatives.

The methodology used to accomplish this study included identifying and quantifying the historical cost of occupational injury and illness, translating related costs

into impact on profitability, projecting the estimated costs associated with an ergonomic program intervention, and applying UnitedHealth Group's cost-benefit financial model to estimate the return on an ergonomic risk control initiative.

The literature reviewed the types of related costs to be considered, methods of translating costs into business terms, cost and benefit statistics associated with ergonomic interventions, and financial cost-benefit models to project return on investment.

The first goal of this study was to conduct an analysis of Uniprise workers compensation claims to determine the number, total cost, and distribution of claims as they relate to the Uniprise business segment. Based on the distribution and cost of claims by injury cause, a risk control intervention focused on reducing cumulative trauma disorders within the Production and Service divisions would have the greatest impact on the costs associated with occupational injuries and illnesses occurring within the Uniprise business segment.

The second goal of this study was to quantify the operational impact of occupational injuries and illnesses by translating costs into impact on profitability within the Uniprise. Using 2001 as an example, \$7,297,382 in additional revenue was required to compensate for Uniprise occupational injuries and illnesses occurring that year. While substantial, in addition to showing impact on revenue, the cost of occupational injuries and illnesses in terms of impact on productivity would provide a more meaningful business measure.

The third goal of this study was to estimate the costs and benefits of an ergonomic risk control intervention and apply those estimates to a financial model to determine the return on investment associated with the intervention. Based on the positive return on

investment resulting from the application of the UnitedHealth Group Cost-Benefit model, a formal ergonomic risk control intervention would be a profitable investment for Uniprise.

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## Chapter 1

### Statement of the Problem

#### Introduction

In August 1998, UnitedHealth Group underwent a major reorganization in an effort to reduce the operating cost run rate by 10%, or \$300 million, by the end of 2000. In order to manage operating costs more effectively, the Company focused its efforts on rethinking all expenditures, realigning the organization to eliminate duplication, streamlining operations, and introducing new technology to minimize manual tasks. The reorganization further developed specialization within each business segment and shifted a substantial portion of claims management and customer service functions within the Company to the Uniprise business segment.

Today, Uniprise is the largest subsidiary of UnitedHealth Group, comprised of approximately 10,152 employees nation-wide, out of a total of 29,845 employees within UnitedHealth Group. Uniprise is a health care service provider for large, multi-site employers with over 5000 employees, and also provides management and service functions for other organizations in need of technology and unique transactional support for complex health care services needs including member enrollment, eligibility, claims management and customer service. Uniprise currently manages more than 240 large, multinational customers including 134 *Fortune*® 500 companies and 50 *Fortune*® 100 companies. Uniprise established a segment goal of reducing expense run rate by \$24 million during the year 2001 (Bahl, 2002). Uniprise missed the cost control target by an estimated \$7 million for the full year, creating a larger burden to achieve 2002 financial commitments (Bahl, 2002).

Efforts toward reducing operating costs have been particularly daunting given recent economical conditions. The economic downturn that climaxed in 2001 is expected to continue into 2002 and the US Gross Domestic Product (GDP) is expected to slow to 1% (Bahl, 2002). Uniprise expects that meaningful corporate profitability improvement will be stalled until at least the third quarter of 2002 (Bahl, 2002). In response to the events of September 11, 2001 and the Enron scandal, it is also anticipated that material layoffs will continue during the first half of 2002, leading to increased unemployment along with the possibility of new large employer bankruptcies and increased mergers and acquisition activity.

Uniprise anticipates greater impact from the continuing economic downturn than other UnitedHealth Group businesses because of its supplier base and customer population. For example, Uniprise currently serves over 600,000 airline employees and dependents, a sector that has been severely impacted over the last two years. Uniprise endured layoffs of over 400,000 insured individuals and four client bankruptcies during 2001. Additionally, as a health care company, Uniprise is also directly impacted by annual double-digit increases in medical costs. Rising benefit costs, increasing economic pressures and softer labor markets continue to drive large employer focus more heavily to cost, resulting in a shrinking large employer health benefits market.

Over the past several years, the traditional claims management/call center environment has transitioned to a workplace driven by technology and increased production. With the development of the Internet and computer technology, work demands have changed dramatically. Advanced computer programs allow Uniprise



employees to handle higher production goals while still maintaining quality. The increase in work demand has resulted in an increased risk for cumulative trauma injury associated with performing highly specialized, repetitive tasks over a minimum of an eight-hour workday. As a result, Uniprise experiences considerable direct costs associated with occupational injuries that impact overall profitability.

It is widely accepted that removing or controlling identified safety and health hazards in the workplace, can result in savings from fewer lost workdays, improved productivity, improved work quality, increased worker morale and job satisfaction, lower workers' compensation and medical costs, and reduce risk for Occupational Safety and Health Administration (OSHA) fines and litigation. Risk control decisions have become more difficult given today's operating environment and the focus on economic impact. While the speculation of potential benefits may provide limited support, currently, UnitedHealth Group does not have a formal system to cost justify risk control initiatives. To effectively propose and gain support for a risk control initiative focused on the reduction of cumulative trauma injuries within Uniprise; it is necessary to establish a clear, standardized method of quantifying the financial impact of injury.

#### Purpose of the Study

The purpose of this study was to develop a comprehensive, business-based cost impact analysis focused on cumulative trauma disorder that adequately represents the direct cost of injuries to Uniprise and can be used in conjunction with a cost-benefit model to determine the financial feasibility of a formal ergonomic intervention within the Production and Service divisions of Uniprise.

## Goals of the Study

The goals of this study include the following:

1. Conduct an analysis of Uniprise workers compensation claims to determine the number, total cost, and distribution of claims as they relate to the Uniprise business segment, focusing on cumulative trauma disorder within the Production and Service divisions.
2. Quantify the operational impact of occupational injuries and illnesses by translating costs into impact on profitability within Uniprise.
3. Estimate the costs and savings of a formal ergonomic intervention within the Production and Service divisions of Uniprise and apply those estimates to a cost-benefit model to project the return on investment.

## Background and Significance

Since 1999, Uniprise has contributed over 33% of the total number of workers' compensation claims that have incurred costs within UnitedHealth Group and over 41% of the total cost of claims, accounting for \$4,909,453 in developed, direct costs. Of the total contribution, 36% of reported claims and 44% of the total cost can be attributed to cumulative trauma disorder, accounting for \$2,143,558 in developed, direct costs. Two primary divisions within Uniprise, Production and Service have contributed 45% of claims reported, accounting for \$2,497,682 or 51% of the total developed cost of injuries and illnesses.

The Production and Service divisions of Uniprise present significant risk factors for cumulative trauma disorder, most predominantly the highly repetitive nature of claims management and customer service activities. As Uniprise continues to refine its key

business processes to reduce operating costs, fewer employees will be expected to contribute greater productivity, while maintaining or improving quality, further increasing the risk for injury.

### Definitions

Fortune® 500 - America's largest 500 corporations by sales, profits, assets and market share.

Fortune® 100 - America's largest 100 corporations by sales, profits, assets and market share.

Gross Domestic Product (GDP) - The market value of all goods and services produced in a year within the borders of the United States.

Developed Costs – The change, over time, in the reported number or cost of claims for a particular accident year, policy year or injury year associated with maturation time and reporting lags. Development factors are based on industry actuarial studies.

### Summary

Historically, UnitedHealth Group and Uniprise have employed a reactive approach to risk control, based on the direct cost of risk. While workers compensation costs are allocated to each business segment on an annual basis based on past experience, the impact has not been sufficient to incite formal preventive action. A clear, standardized method for quantifying the direct cost impact of occupational injuries is critical to the cost-justification of risk control intervention processes within UnitedHealth Group and the Uniprise business segment. The financial impact of occupational injuries and illnesses must be quantified in business terms to effectively illustrate the impact on

operating costs and the bottom line. To align risk control with other company operations, proposed interventions must be analyzed by the same financial model applied to all other operational capital expenditures.

## Chapter 2

### Review of Literature

#### Defining Accident Costs

The study of the cost of occupational accidents began with H.W. Heinrich during the 1920s. Heinrich (1959) was the first to argue that the cost of accidents was grossly underestimated in that most accident costs are hidden. Heinrich also claimed that indirect costs such as lost productivity and repair and replacement costs far exceeded direct costs of an accident including medical expenses and insurance compensation. Since Heinrich, researchers in the field of risk control have long supported that the ultimate cost of an accident largely exceeds the obvious direct costs such as medical expenses and premium costs, typically associated with workers compensation insurance.

Over the last several decades, the concept of defining and categorizing costs has evolved and become more diversified in an effort to raise employer awareness and motivate more aggressive risk control efforts. According to Dorman (2000), the most recent upsurge in interest can be attributed to several factors. First, businesses have begun to recognize that damage to workers has at least an enterprise-wide impact and potentially an impact on whole economies. Recognizing these collateral consequences has begun to influence the expectation for risk control improvements. Second, key decision-makers within businesses respond to economic motivation. Applying an operationally based economic cost structure to risk control will allow related interventions to mirror the management decision-making process. Finally, the economic cost of occupational injury and illness has become a competitive factor in the global marketplace.

Today, research supports a wide variety of alternative cost allocation systems that classify consequences in a variety of ways including economic or non-economic, direct or indirect, and internal or external (Dorman, 2000). Recent studies also further define the cost of workplace injuries and illnesses by consequences to the worker and consequences to the employer. Yet another emerging theme focuses on the social consequences of occupational injuries and illnesses.

Economic or non-economic costs. Categorizing occupational accident costs as economic or non-economic encompasses the causes and consequences of, “the role of economic factors in the etiology of workplace ill-health and the effects this has on the economic prospects for workers, enterprises, nations and the world as a whole” (Dorman, 2000). It is therefore one of the more broadly defined classifications of the costs of occupational accidents. The significance of the economic or non-economic cost distinction is that it develops the case for risk control intervention independently, without consideration of ethical or societal considerations.

In general, non-economic costs are those that cannot be objectively quantified and captured as a monetary value. Dorman (2000) defines non-economic costs as predominantly the “human cost of ill-health or premature death such as, pain, fear and loss suffered by the victims, their families, and their immediate communities.” Several studies report that disabling injuries, illnesses and fatalities can have profound human consequences however very few attempts have actually been made to quantify the impact of non-economic costs. Dorman (1996) critiques those efforts that have made to place a monetary value on the human cost of accidents such as the pain and suffering, loss of function, diminished quality of life, and premature death and states that ultimately, no

number is accurate for related losses that cannot be objectively quantified. However, understanding the scope of the non-economic costs of injuries and illness is critical to anticipate and measure the full impact of workplace accidents.

Conversely, economic costs are those that can be calculated and expressed in monetary terms, but don't necessarily result in financial outlays. As such, the economic costs of injury and illness are more easily isolated and quantified. Within the realm of economic costs, several distinctions can be made between social or private costs and financial or implicit costs (Dorman, 2000). Distinctions can also be made between costs that are relatively constant regardless of the degree of injury or illness and those that are variable, which contributes to the economic incentive to reduce incidence or severity rates (Dorman, 2000). Overall, economic costs span all other classification of accident costs and include elements from each. At the same time, all other classifications of accident costs include elements of economic and non-economic varieties.

Direct and indirect costs. The most widely accepted and applied method of categorizing loss relates directly to Heinrich's concept of "hidden" costs and defines losses as direct or indirect. While the theoretical concept of direct and indirect costs has remained relatively consistent over the years, it is clear that each author draws this distinction somewhat differently. For example, Simonds and Grimaldi (1956) supported Heinrich's claim that indirect costs are large relative to direct costs but argued that many costs defined by Heinrich as direct are actually indirect. Ven Den Raad (1999) broadly defines direct costs as those that are directly associated with the accident such as investigation costs, production downtime, medical expenses, damage to equipment or product, sick pay, repairs, legal costs, and court fines. He defines indirect costs as those

that are indirectly linked to the accident such as employers and public liability claims, business interruption, product liability, training of replacement staff, loss of goodwill, and loss of corporate image. Klen (1989) further differentiated direct and indirect costs as: (a) primary direct costs, or payments required by law to compensate and indemnify injured workers, (b) secondary direct costs, or other payments to either the injured worker or the government, and (c) indirect costs, or costs that are inferred but do not have direct financial consequences.

According to Dorman (2000), in general, if the amount of a cost and its cause is automatically reported in a business's routine accounting system, from a managerial perspective, it can be considered direct. Alternatively, if a cost cannot be quantified and allocated in terms of an extra expenditure of time and resources, it can be considered indirect. Looking at it in a broader scope, indirect costs are those costs that are not classified as direct. Ultimately, the division of direct and indirect costs primarily depends on the accounting system the business uses. A more sophisticated accounting system will more broadly define direct costs while a less sophisticated accounting system will more broadly define indirect costs.

Estimates of indirect costs as a proportion of direct costs have ranged from 1:1 to 20:1, depending on the type of industry and methodology used (Head and Harcourt, 1997). While it's widely accepted that the ultimate financial consequences of indirect costs exceed those of direct costs, they are rarely included in a cost impact analysis for several reasons. First, indirect costs can be difficult to identify, value and quantify, resulting in considerable time and effort spent. Second, standard accounting methods are biased toward "hard" asset valuation such as property rather than "soft" asset valuation



that indirect costs propose (Blair, 1995). Finally, cost allocation is often applied across business units by payroll rather than actual claim experience, making it difficult to establish a clear cause-effect relationship (Hopkins, 1995).

Internal and external costs. The cost of occupational injuries and illnesses can also be classified as internal or external to the organization. Dorman (2000) defines an internal cost as one that is generated and paid by the business and an external cost as one that results from the business activities but is paid by parties external to the business such as the injured worker, family and friends, and the surrounding community. Internal costs include direct costs such as workers' compensation insurance, medical expenses and damaged property as well as indirect costs such as lost production, retraining and litigation. Examples of external costs include the injured worker's current and future lost wages that are not replaced by workers' compensation, medical expenses not compensated through employer-paid insurance, lost household productivity, environmental contamination and lost productivity to society (Dorman, 2000). A large portion of the economic costs of injuries and illnesses do not fall on employers but rather, are paid by workers, their families and their communities.

Some potential external consequences such as environmental contamination are highly regulated and must be considered by businesses that pose such hazards. However, most external costs may or may not be considered by businesses and provide a conflicting interest between businesses and the wider community. According to Dorman (2000), cost externalization presents more of a problem under certain market conditions including a high degree of market competition, periods of higher unemployment, and a financial market that supports risk transfer and social insurance programs. Dorman states that

determining internal and external costs is significant in that it defines the gap between the economic incentive to the individual decision-maker and the corresponding incentive to society. While perhaps most of the costs associated with occupational injuries and illnesses are external to the employer, they are generally not considered in the general accounting practices used today.

Worker costs and employer costs. Similar to internal and external costs, a more recent division of occupational costs associated with injuries and illnesses is the distinction between costs to the injured worker and costs to the employer (Boden et al., 2001). Employer costs essentially mirror the internal costs previously defined. Costs to injured workers include economic and non-economic consequences to themselves and their families. Recent studies support that much of the economic and non-economic burden of the total cost of injury and illness for workers and their families results in economic burden to the injured worker (Boden and Galizzi, & Reville, 1999, 1999). Reville, Bhattacharya, and Sager Weinstein (2001) estimate that injured workers who lose at least a week of time away from work or suffer permanent disabilities lose over \$10,000 in earning capacity. Marquis and Manning (1999) estimate the lifetime cost of disabling injuries to be over \$31,183. Weil (2001) points out that recent estimates account for only a minor portion of an injured workers total cost when medical and other costs that cannot be measured in monetary terms are considered.

Dorman (2000) identifies several social factors that increase a worker's risk for occupational injury and illness which impacts the ultimate economic burden including precarious employment, work in small and medium companies and working groups that are subject to discrimination and marginalization. Precarious employment refers to

contingent employment options such as temporary employment, leased employment, consultation or outsourcing arrangements, part-time employment, multiple site employment or a combination (Dorman, 2000). There has been a significant increase in precarious employment arrangement in developing countries in the last several decades suggested to be associated with technological advances, increased international competition, new patterns of consumer demand and changes in government policy (Quinlan, 1999). Dorman states that precarious employment arrangements weaken the claims that employees can make against employers due to the tenuous relationship that is established. Quinlan shows that precarious employment is linked to increased risk associated with less training, less awareness of worker rights, poorly defined employer relationships, pressure to maximize output and little input into work conditions.

Dorman (2000) states that small and medium sized enterprises are likely to have greater risk for occupational injury and illness due to the fact that smaller firms have smaller revenue bases over which costs can be distributed and generally experience a more competitive financial environment. Therefore, risk control interventions that significantly impact overhead costs are less likely to be prioritized.

Lastly, Dorman (2000) suggests that groups that have lower socioeconomic status are likely to experience more hazardous working conditions. Studies have confirmed that racial and ethnic minorities in the U.S. have higher accident rates (Loomis, Richardson, Worf, Runyan, and Butts, 1997) in addition to immigrants (Bollini and Seim, 1995), workers with less education and low income (Robinson, 1988). In summary, those who experience the poorest working conditions are likely to bear other social and economic costs.

To further quantify the impact, Keogh, Nuwayhid, Gordon, and Gucer (2000) conducted a study to look at the outcomes associated with workers who had experienced cumulative trauma disorders and filed workers compensation claims. At 28 months past the initial claim filing, about half of the interviewed claimants reported that symptoms continued to be severe enough to interfere with work, home activities or sleep. Over 80% reported decreased functionality and 38% indicated that they had been laid off, fired or quit the job they had at the time of the injury. Lastly, 84% reported having at least a portion of their medical care paid for by workers' compensation however a third of respondents were required to borrow money to supplement or pay for medical treatment (Keogh et. al., 2000).

Social consequences of injuries and illnesses. According to Dembe (2001), while most outcome studies of occupational injuries and illnesses tend to focus on direct economic costs such as workers' compensation insurance payments, incurred medical costs and the duration of work disability, there is an increasing body of literature focused on researching social consequences. Verbrugge (1997) states that social consequences of injury and illness can be expressed in terms of the impact on the affected person's ability to engage in major social role activities including work, parenting, caring for family members, and contributing to the community. Dorman (2000) describes social costs more comprehensively as the sum of all costs of worker injury or illness. It is collectively agreed that while the social consequences of injury and illness most directly affect the injured worker, the ultimate impact extends to family members, coworkers, health care providers, insurance companies, courts and the local community at a minimum (Dembe, 2001).

The social consequences of occupational injury and illness are difficult to define and quantify due to the overlap with economic and clinical consequences and the interdependencies they create. To illustrate the complexities of these interdependencies, Dembe (2001) developed a comprehensive table categorized by who is affected, the corresponding societal role, where the impact occurs and potential effects. Examples of affected individuals and groups include the work environment, family and friends, and the surrounding community. Examples of societal roles include vocational, domestic, leisure, recreational, civic, political, religious, economic, educational, professional, biological and cultural. Examples of where the impact occurs include workplaces, hospitals and clinics, homes, neighborhoods, churches, schools, stores, businesses, courts, prisons and social care agencies. Lastly, examples of potential effects include vocational function, psychological and behavioral responses, social effects, and physical status or limitations.

These complex and mutually dependent interactions have made it difficult for researchers to study the impact of the social consequences of injury and illness. Analyses that have been completed are likely to be fragmented and based on the investigator's ability to isolate social impacts. For example, Keller (2001) limits the study of social consequences to data derived solely from worker ratings, excluding dollars or clinical instrumentation.

In addition to the reciprocal relationships defining the social consequences of injury and illness is further complicated by several factors including consideration of the magnitude and severity of the disorder, sociodemographic factors such as age, gender, race, ethnicity; nationality, education and socioeconomic status and the course of medical

care interaction throughout the injury or illness duration (Dembe, 2001). All of these factors combined make translating the social consequences of injury and illness into an economic format challenging.

### Injury and Illness Data Sources

Recent advances in research pertaining to the costs and consequences of occupational injuries and illnesses have been substantially driven by the availability of more complete data sources (Reville, et al., 2001). Given the broad range of cost classifications presented in today's literature, it has become increasingly important to clearly define and accurately estimate the costs and consequences of injuries and illnesses related to a specific risk control intervention. Valid cost impact analyses require sufficient data for statistical significance however, data sources for obtaining injury and illness statistics are often limited in terms of the type and scope of information they provide. Using data from multiple sources may produce a more thorough and credible cost impact analysis. Injury and illness data sources can be generalized into three basic categories: (a) administrative data, (b) primary data and (c) national databases (Reville, et al., 2001).

Administrative data. The primary data source for direct cost information pertaining to occupational injury and illness is workers' compensation administrative data (Reville, et al., 2001). An advantage to using workers' compensation data to value the cost of occupational injuries and illnesses is that the data is readily available as governments and insurance companies collect the information on a real-time basis. Additionally, workers' compensation data generally contains more comprehensive detail, corresponding to an entire population of claims versus a selected sample. There are also

several disadvantages to workers' compensation administrative data. According to Biddle, Roberts, Rosenmann, and Welch (1998), up to 40% of workplace injuries are not reported as workers' compensation claims. More specifically, Rosenman, et al. (2000), found that in a survey of 1598 workers reporting known or suspected cumulative trauma disorder, only 25% filed for workers compensation. Of the 75% who did not file a workers compensation claim, only 20% reported their injury was not work-related, resulting in a significant underestimation of data. Additionally, data often presents limited demographic information and outcome measures limited to benefits paid. Lastly, workers' compensation data fails to account for the waiting period before benefits ensue and also often fails to account for restricted work activity time as well as subsequent uncompensated time away from work due to the injury or illness (Reville, et al., 2001).

Primary data. Another method of amassing cost information associated with occupational injury and illness is through primary data collection. Primary data collection refers to employing direct employee survey and questionnaire techniques focused on gathering incident specific information (Reville, et. al., 2001). The advantage to primary data collection is the ability to collect very detailed information including costs that would typically be classified as indirect, non-economic, worker related and social, over a specified period of time (Hensler, et al., 1991). However, primary data collection is rarely a viable option on a large-scale due to certain characteristics inherent to occupational injuries and illnesses including their rarity and complexity. For example, according to Reville, et al. (2001), a sample of 300 workers with occupational injuries in a year would require that 10,000 households be surveyed. Primary data collection is more suitable for a more limited population as more extensive application is challenging.

National databases. There are four national database resources most often used to gather injury and illness information pertaining to American workers. The U.S. Bureau of Labor Statistics (BLS) Annual Survey is a Federal and State program that collects recordable injury and illness data from private industry establishments on an annual basis including representative information from employers normally exempt from maintaining the OSHA 300 summary logs (U.S. Bureau of Labor Statistics, 2001). The resulting survey estimates of occupational injuries and illnesses are based on a selected probability sample, rather than a census of the entire population. The BLS states that the relative standard error is used to calculate a confidence interval of 95%. The National Traumatic Occupational Fatalities (NTOF) identifies occupational injury fatalities based on death certificates from each state and provides descriptions of causes of death and comparison of rates among industries and occupations as well as trends over time. The National Institute of Occupational Safety and Health (NIOSH) Division of Safety Research uses NTOF data to perform epidemiological studies of work related fatalities. The Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI) also collects data on fatal occupational injuries. Unlike the NTOF, the CFOI collects census data through federal and state injuries and also captures some fatal illnesses, such as heart attacks, that occur at work. Finally, the National Council on Compensation Insurance (NCCI) collects and analyzes data from private workers' compensation insurance providers in 13 states.

As the reliability and validity of the data is based on the confidence interval, sampling techniques and data collection process, the quality and usefulness of national databases is often challenged (Murphy et al., 1996). Additionally, these types of databases are limited to information regarding prevalence and frequency of injury.



### Analyzing Loss Data

Workers' compensation analysis. Depending on the data available, there are several statistical measures used to evaluate the outcomes and results of occupational injuries and illnesses. The Minnesota Department of Labor provides a comprehensive list of the types of workers' compensation data that can be analyzed including but not limited to (a) the number of medical and indemnity worker's compensation claims paid, (b) paid workers' compensation claims per 100 full-time equivalent (FTE) workers, and (c) average indemnity and medical costs of insured claims. Claims are counted in the year of injury or onset of illness and are based on the total incurred value as of the date of analysis. Claim costs are also developed to project the ultimate cost of claims and to normalize the data (Minnesota Department of Labor and Industry, 2002).

Incidence rates. Occupational Safety and Health (OSHA) incidence rates can also be used to show the relative level of injuries and illnesses within a single company or operations within a single company (U.S. Bureau of Labor Statistics, 2001). According to the BLS, because a common base and a specific period of time are involved, OSHA rates can define areas of increased injury and illness rates as well as progress in preventing work-related injuries and illnesses.

The three primary rate calculations performed most consistently by the BLS and general industry include the Total Recordable Incidence Rate, the Lost Workday Case Incidence Rate and the Severity Rate. The Total Recordable Incidence Rate measures the number of full-time employees who have suffered a recordable injury during a given calendar year. The Lost Workday Case Incidence Rate measures the total number of cases that involve days away from work, days of restricted work or both. The Severity

Rate measures the total number days-away-from-work or restricted work activity days.

All rates represent the number the number of injuries and illnesses per 100 full-time workers and are calculated as:  $(N/EH) \times 200,000$ , where N = number of injuries and illnesses, EH = total hours worked by all employees during the calendar year and 200,000 = base for 100 equivalent full-time workers working 40 hours per week, 50 weeks per year (Bureau of Labor Statistics, 2001).

### Valuing Loss in Business Terms

To align risk control with business operations, the Occupational Safety and Health Administration (OSHA) (1998) released an interactive software program, "Safety Pays," to assist employers in assessing the impact of occupational injuries and illnesses on company profitability. It uses a company's profit margin, the average costs of an injury or illness, and an indirect cost multiplier to project the amount of sales a company would need to generate in order to cover those costs. OSHA used its own figures and those of the National Safety Council and insurers to determine the cost of abrasions, strains, fractures, and other injuries and fatalities (OSHA, 1998). In addition to valuing loss in terms of impact on profitability, many companies also use internal financial indicators such as cost per part or cost per call to quantify the impact of occupational injuries and illnesses.

### Estimating the Costs and Benefits of Risk Control

In general, a cost-benefit analysis (CBA) quantifies investments in risk control as current expenditures that can generate a stream of benefits over time (Dorman, 2000). The net benefits that an investment is expected to generate are generally expressed in monetary terms and referred to as cost-benefit flows (Kuchler and Golan, 1999). As

such, the first step to cost-benefit analysis is to project the costs and benefits associated with a specific risk control intervention.

Cost of ergonomic intervention. In an effort to gain support for proposed governmental ergonomic standards over the last several years, detailed analyses to quantify the cost of formal ergonomic intervention have become more prevalent. In 2000, the Occupational Safety & Health Administration (OSHA) proposed an ergonomic program rule, estimating costs associated with what OSHA considered to be the essential elements of an ergonomic program including (a) management leadership and employee participation, (b) hazard information and reporting, (c) job hazard analysis and control, (d) training, (e) musculoskeletal disorder (MSD) management and, (f) program evaluation. Projected costs were based on four categories including (a) familiarization costs to determine compliance requirements as established by the rule, (b) cost to implement the basic program, (c) costs to implement the full program and, (d) costs of job control interventions. Overall, OSHA estimated that the ergonomic standard proposed in 2000 would cost \$700 per establishment covered by the standard and \$150 per problem job fixed.

Similarly, the Washington State Department of Labor and Industries (2000) also conducted an analysis to project the costs associated with its proposed ergonomic rule in 1999. The Washington State cost projections were based on the time and cost requirements for businesses to comply with certain elements of the ergonomics rule including (a) rule review, (b) caution zone job identification, (c) caution zone job analysis, (d) engineering and administrative controls, (e) awareness education, hazard job training, (f) training of evaluators, and (g) managerial and administrative time. Total

annualized compliance costs for all businesses in the state of Washington were projected to be \$37.77 per employee.

Benefits of ergonomic intervention. Over the last few decades, there has been substantial literature around the benefits associated with formal ergonomic program initiatives. Reported benefits include increased productivity, decrease in employee turnover, reduced absenteeism, increased employee satisfaction, increased work quality, and decreased number, severity and associated cost of occupational injury and illness (National Institute of Occupational Safety & Health [NIOSH], 1997). The Occupational Safety & Health Administration (OSHA), focused on four key benefit measures to project the estimated benefits of its proposed ergonomic standard, based on a review of epidemiological and intervention studies. Key measures included injury rates, number of lost workdays, number of workers' compensation claims, and cost of workers' compensation claims. Based on the reviewed studies, OSHA reported an average reduction in injury rates of 67%, an average reduction in lost workdays of 74%, an average reduction in the number of workers' compensation claims of 74% and an average reduction in the cost associated with workers' compensation claims of 71%.

Perhaps the most recent, comprehensive summary of the benefits associated with formal ergonomic intervention was compiled by the Washington State Department of Labor & Industries (2000) as part of the cost-benefit analysis conducted to support the Ergonomic Rule proposed in May 2000. The Washington State cost-benefit analysis cited 62 ergonomic intervention studies covering a variety of industries, study design types, covered timeframes and observed musculoskeletal disorders. Population among the studies ranged from 6 employees to 50,000 employees. Overall, the Washington

State review reported an average reduction in lost workdays across those studies that reported results of 65%, an average reduction in number of injuries of 48%, and an average reduction in total associated health costs of 65%.

#### Financial Models to Value Risk Control Initiatives

There are various financial models are used to determine the capital value of a risk control intervention and translate costs into return on investment. Financial models to value loss and predict the cost effectiveness of risk control investments that involve significant capital must be 1) precise and accurate, 2) significant to the organization and 3) able to be benchmarked (Dorman, 2000). Financial metrics help to define the impact of occupational injuries and illnesses on the profitability and the financial impact risk control decisions (Bjurstrom, 1999).

There are several financial accounting models used to value the costs and benefits of occupational injuries and illnesses including but not limited to discounted payback period, net present value and internal rate of return (Nelson and Cook, n.d.). Utilization of financial accounting methods accomplishes several goals including translating mission and vision statements into operational terms, integrating risk control with the rest of the business and linking risk control functions to overall business goals and objectives (D'Arcy, 2001).

Discounted payback period. The discounted payback period is frequently used as a capital investment evaluation technique by businesses. Similar to the payback period model, the discounted payback period method calculates the length of time it takes to recover the initial cash flow of the investment, and incorporates the time value of money in the equation (Bhandari, 1986). This method determines the period beyond which an

investment will generate economic profit. According to Bhandari (1986), the discounted payback period is limited by the time needed to “pay” for the investment with discounted cash flows rather than measuring the return on investment over the life of the investment. Therefore, the discounted payback period may be better suited for short-term investment analysis (Nelson and Cook, n.d.).

Net present value. The net present value model (NPV) considers the value of future cash flows in terms of today’s dollars. Similar to the discounted payback period, the NPV discounts future cash flows against the cost of capital, or any other rate the user might prefer, giving a more accurate indication of future savings in terms of today’s dollars (Nelson and Cook, n.d.). If the net present value of the cash inflows are greater than the net present values of the cash outflows i.e. a “positive” NPV indicating that the benefits exceed the cost, the investment is acceptable. Conversely, a negative NPV indicates that the costs exceed the benefits (Kuchler and Golan, 1999). Net Present Value is very useful as it considers both the time value of money and future cost-benefit flows, however, it is more difficult to calculate than the discounted payback period (Nelson and Cook, n.d.).

Internal rate of return. The internal rate of return (IRR) is the third more widely accepted way of determining the efficiency of an investment. In general, the internal rate of return is the total interest yield generated by an investment over its life (Baker, 1997-2000). According to Nelson and Cook (n.d.), it can be more specifically defined as the discount rate that results in the equalization of the present value of the cash outflows and the present value of the cash inflows. The IRR is similar to the discounted payback period and the net present value methods in that it also considers the time value of money

(Nelson and Cook, n.d.). According to Brigham (1988), the IRR has limited application, as it is difficult to calculate. Additionally, the IRR is based on the assumption that the company has the opportunity to reinvest the cash generated at the internal rate of return rather than at the cost of capital which implies that the cost-benefit flow is equally dependent on the timing of the investment (Kuchler and Golan, 1999).

### Summary

According to Dorman (2000), “occupational injuries and illnesses are matters of health, but they are also matters of economics, since they stem from work, and work is an economic activity.” Today’s businesses make operational investment decisions based on economic theory. Translated to risk management, an employer will make the decision to implement a risk control intervention only if the cost of not doing so exceeds the cost of prevention (Shapiro, 1999).

There are several steps involved with measuring the costs and benefits involved with a specific risk control intervention. The first decision that analysts must make is to define the types of costs that will be isolated, and what unit of measurement will be used (Kuchler and Golan, 1999). To provide an effective incentive for the implementation of a risk control intervention, costs must be economic, internal, variable, and visible (Dorman, 2000). The second step is to calculate the economic costs for the types of injuries and illnesses selected, based on the definition criteria established in the first step. A more comprehensive economic cost analysis including multiple data sources will create a more complete, accurate picture of the current problem. Finally, applying a proposed risk control investment based on projected costs and benefits to a financial model that predicts the cost-effectiveness of implementation and can be measured against other business

investment opportunities allows decision-makers to anticipate the maximum rate of return (Kuchler and Golan, 1999).



## Chapter 3

### Methodology

#### Method of Study

The primary objective of this descriptive study was to translate the cost of occupational injury and illness into an operationally based, financial cost-benefit model that can be used to support an ergonomic risk control intervention within the Uniprise business segment of UnitedHealth Group. The methodology to achieve this objective can be categorized into four general sections: (a) identifying and quantifying the historical cost of occupational injury and illness, (b) translating related costs into business-based economic measurement criteria to effectively define the impact on profitability, (c) projecting the estimated costs associated with an ergonomic program intervention, and (d) proposing a cost-benefit financial model to estimate the return on a risk control initiative. The Review of Literature helped to determine the scope of this study by analyzing the types of related costs to be considered, reviewing methods of translating costs into business terms, researching cost and benefit statistics associated with ergonomic interventions, and identifying various financial models to translate costs and benefits into business terms.

#### Outline of Methodology

- I. Target population. The Uniprise business segment of UnitedHealth Group was chosen as a target population for this study based on its size, employee population and contribution to UnitedHealth Group's overall workers' compensation experience.

- II. Historical cost of occupational injuries. The costs of occupational injuries and illnesses were limited to developed, direct costs associated with workers' compensation claims as well as additional administrative costs to associated with managing and maintaining the workers compensation program. Data collection and analysis was limited to occupational injury and illness data from January 1, 1999 through April 30, 2002. More current data was chosen to more accurately reflect the organizational changes that have occurred since 1998.
- A. Workers compensation injury analysis. Data was collected from two primary databases linked to two third party administrators that managed claims during the specified time period. Analyzed data was specific to the Uniprise business segment with some comparison to UnitedHealth Group overall experience. Key indicators included incidence data, severity measured in terms of lost time and overall financial impact, and descriptive data.
- B. Administrative cost assessment. Overhead costs associated with the administration of the workers' compensation program including claims processing and administration fees, payment for the waiting period prior to the onset of workers' compensation coverage, and internal risk management salaries. A portion of the measured costs was attributed to the Uniprise business segment based on historical claims experience.
- III. Cost impact on profitability. The direct cost of occupational injuries and illnesses were translated into impact on profitability within Uniprise using 2001 as the most recent, complete year. Impact on profitability was calculated by using the profit margin to determine the actual cost of injuries in terms of the additional

revenue needed to pay for the injury during a specified time period. Average medical-only claim cost, average lost time claim cost, and average cost for cumulative trauma disorder were considered.

- IV. Cost-benefit analysis model. The UnitedHealth Group cost-benefit analysis model was used to estimate the return on investment of a risk control program. Key components of the combination net present value/internal rate of return model included project cost estimation, assumptions, estimated savings associated with the project and return on investment calculations.
  - A. Project cost estimation. The cost of a risk control intervention related to the prevention of cumulative trauma injuries was estimated by quantifying required resources including personnel, training, and furniture and equipment needs. The general procedure used to estimate the costs for the intervention was modeled after the Cost Benefit Analysis of the Ergonomic Standard conducted by the Washington Department of Labor and Industries in May 2002. Estimates were based on Uniprise Production and Service division population and were not considered to be indicative of a comprehensive program but rather an initial, three-year phase of implementation.
  - B. Estimated project savings. Estimated projected savings were quantified in terms of the reduction in the number of related injuries and illnesses. Estimated savings or benefits associated with an ergonomic risk control intervention were also modeled in part after the Cost Benefit Analysis of the Ergonomic Standard conducted by the Washington Department of Labor and Industries in May, 2002. The average cost of medical claims and average cost

of lost time claims were used as baseline expenditures. Administrative costs were also applied as a percent of total costs per claim.

- C. Internal rate of return calculation. The projected internal rate of return was calculated to determine the interest rate that is equivalent to the monetary return or savings expected from the risk control intervention. The internal rate of return was compared with current investment rates to determine if the intervention as defined in the cost-benefit analysis would be considered acceptable in financial terms.

## Chapter 4

### Results and Discussion

#### Summary of Methods Used

The methodology used to accomplish this study included identifying and quantifying the historical cost of occupational injury and illness, translating related costs into impact on profitability, projecting the estimated costs associated with an ergonomic program intervention, and applying UnitedHealth Group's cost-benefit financial model to estimate the return on a risk control initiative aimed at reducing the occurrence of cumulative trauma injury and illness. First, a target population was chosen, based on the size of the business segment and the overall contribution to UnitedHealth Group workers' compensation costs. Next, the types of costs associated with occupational injury and illness were selected and analyzed, based on their ability to be isolated and monetarily quantified. Total costs were then translated to impact on productivity and profitability within the Uniprise business segment, focusing on key production standards within the Production and Service divisions. Finally, the estimated costs and benefits of an ergonomic program were applied to a financial model to determine the internal rate of return.

#### Target Population

UnitedHealth Group has approximately 29,845 employees throughout the United States, housed in six business segments, each operating as independent companies with separate financials. Uniprise is the largest business segment of UnitedHealth Group with approximately 10,152 employees nation-wide. As the largest business segment, Uniprise also significantly contributes to overall workers' compensation costs on an annual basis.

Since 1999, Uniprise has contributed over 33% of the total number of reported workers' compensation claims for UnitedHealth Group and over 41% of the total cost of injuries, accounting for \$4,909,453 in developed medical and indemnity costs.

Of the total Uniprise population, 6192 or 61% of the employees currently reside in two divisions, Production and Service. Correspondingly, Uniprise Production and Service divisions have contributed 44% of reported claims and 58% of the total cost of Uniprise occupational injuries and illnesses since 1999, accounting for \$3,548,769 in related costs which represents over 35% of UnitedHealth Group's total cost. Based on the large employee population as well as the contribution to overall workers' compensation costs, Uniprise was chosen as the target population for this study, with special emphasis on the Production and Service divisions.

#### Workers' Compensation Loss Trend Analysis

A data file containing Uniprise workers' compensation experience for the experience period 1/1/99 - 4/30/02 was prepared by consolidating information from the Travelers Insurance Company (TIC) Risk Management Insurance System (RMIS) database from 1/1/99 – 2/28/00 and the Crawford & Company RMIS database from 3/1/00 to 4/30/02 for analysis. Information from both databases was cross-referenced with the UnitedHealth Group human resources database to obtain specific business segment, unit, function, and job classification information. The intent of the analysis was to determine the total number of claims that have incurred cost, total cost and distribution of claims and injury types as they relate to the Uniprise business segment. The goal was to quantify the costs associated with workers' compensation claims and determine predominant injury types by functional division.

Number and cost of claims. Table I represents the annual number of Uniprise workers' compensation claims that resulted in incurred cost and the total cost of claims through 4/30/02 as of 5/21/02. Costs reflect the total amount incurred including paid and reserved medical expenses, indemnity expenses and ancillary expenses such as legal fees charged to the claims files. Zero-dollar or "incident only" claims were excluded from the analysis. Claims reported in 2002 were annualized and industry development factors were applied to each year to project the ultimate cost of claims.

The number of reported claims has decreased by a greater margin each year from 5% in 2000, 10% in 2001 to a projected 27% in 2002 while the cost of claims has fluctuated since 1999 with a high projected in 2002 of \$2,151,803. The Occupational Safety and Health (OSHA) Recordable Incidence Rate was also calculated to apply hours worked as a common denominator. The OSHA Recordable Incidence Rate also reflects a decrease in the number of recordable incidents over the measured period.

Table I

Uniprise Annual Number and Cost of Injuries

Fiscal Year	1999	2000	2001	2002
Number	196	187	168	165
Total Cost	\$1,296,372	\$1,650,770	\$1,011,827	\$2,151,804
Recordable Incidence Rate	1.74	1.59	1.40	1.25

Note. Occurrence and cost data for 2002 was annualized and industry development factors were used to project the ultimate cost of claims. Development factors were 1.151391, 1.238315, 1.484429, and 4.264578 from 1999 to 2002 respectively.

Annual number and cost by division. Table II represents the total number and cost of reported claims for the six leading functional divisions of Uniprise in aggregate over the total period measured. The six divisions represented account for over 87% of the total number of reported injuries and illnesses. Combined, the Production and Service divisions account for 44% of reported occupational injury and illness and 58% of the total cost after development. The Operations division has contributed 21% of reported claims and 18% of the total cost of injuries, however losses have been trending dramatically downward since 1999 with 80% of the claims occurring in 1999 and 2000. The number and cost of injuries and illnesses within the Production and Service divisions have been steadily increasing since 1999 with 70% of claims occurring in 2001 and 2002.

Table II

Uniprise Number and Cost by Functional Division

Division	Number	% Total	Cost	% Total
Operations	150	21	\$1,112,576	18
Government	63	9	\$420,586	7
Production	135	19	\$2,135,273	35
Technologies	20	3	\$105,190	2
Service	178	25	\$1,413,496	23
Finance	79	11	\$590,660	10

Note. Occurrence and cost data for 2002 was annualized and industry development factors were used to project the ultimate cost of claims. Development factors were 1.151391, 1.238315, 1.484429, and 4.264578 from 1999 to 2002 respectively.



Number and cost by injury cause. Table III represents the number and cost of occupational injury and illness by the leading six major cause of injury including average costs per injury in each category. Slips, trips and falls (STF) and cumulative trauma disorders (CTD) account for over 73% of reported occupational injuries and illnesses and over 78% of the total developed cost. Cumulative trauma disorders alone contributed over 61% of the total cost of claims. The average cost of a cumulative trauma disorder is \$11,702.

Table III

Uniprise Number and Cost by Injury Cause

Injury Cause	Number	% of Total	Cost	% Total	Avg. Cost.
STF	267	37	\$1,772,041	29	6,637
CTD	257	36	\$3,007,376	49	11,702
Struck By	47	7	\$731,770	12	15,570
Lifting	47	7	\$397,218	7	8,451
Chemical	23	3	\$84,790	1	3,687
Reaching	21	3	\$42,817	1	2,039

Note. Occurrence and cost data for 2002 was annualized and industry development factors were used to project the ultimate cost of claims. Development factors were 1.151391, 1.238315, 1.484429, and 4.264578 from 1999 to 2002 respectively.

Number and cost by injury cause for Production and Service. Table IV represents the number and cost of claims by the leading six injury causes for the Production and Service divisions of Uniprise, accounting for almost 95% of reported claims and almost 100% of the cost. Slips, trips and falls and cumulative trauma disorders account for 75%

of total claims and almost 78% of the cost. Cumulative trauma disorders alone account for 45% of the cost of occupational injuries and illnesses, averaging \$16,904 per claim.

Table IV

Production and Service Number and Cost by Injury Cause

Injury Cause	Number	% of Total	Cost	% Total	Avg. Cost.
STF	141	45	\$1,160,925	33	\$8,234
CTD	95	30	\$1,605,921	45	\$16,904
Struck By	29	9	\$504,168	14	\$17,385
Chemical	14	4	\$78,505	2	\$5,608
Lifting	10	3	\$182,256	5	\$18,226
Reaching	8	3	\$7,563	0	\$945

Note. Occurrence and cost data for 2002 was annualized and industry development factors were used to project the ultimate cost of claims. Development factors were 1.151391, 1.238315, 1.484429, and 4.264578 from 1999 to 2002 respectively.

Average cost of injuries. Table V represents the average cost of medical, indemnity and cumulative trauma disorders by year. The average cost of medical claims had increased by 26% from 1999 to 2000 and 2000 to 2001. Based the annualized and developed claims in 2002, the cost is anticipated to increase even more substantially. Average cost of indemnity claims has fluctuated since 1999, as has the average cost of cumulative trauma disorders with highs projected in 2002.

Table V

Uniprise Average Cost of Injuries by Claim Type

Claim Type	1999	2000	2001	2002
Medical Only	\$819	\$1,108	\$1,507	\$4,984
Indemnity	\$24,483	\$39,098	\$17,999	\$49,298
CTD	\$24,513	\$34,686	\$23,440	\$47,662

Note. Occurrence and cost data for 2002 was annualized and industry development factors were used to project the ultimate cost of claims. Development factors were 1.151391, 1.238315, 1.484429, and 4.264578 from 1999 to 2002 respectively.

Administrative Cost Assessment

UnitedHealth Group maintains a self-insured workers' compensation program and currently contracts with a third party administrator to manage related claims. While the costs presented in the workers' compensation database contribute to a substantial portion of the total direct cost of occupational injury and illness, there are additional administrative costs associated with maintaining the workers' compensation program that are not reflected in the database and are billed separately. These additional administrative costs include employee salary to manage the program, payment of the waiting period before workers' compensation benefits ensue as well as unallocated costs charged by the third party administrator for various administrative services and expenses.

UnitedHealth Group employs one person to oversee the workers' compensation program at a salary of \$67,500. At a 33 % allocation rate based on the number of occupational injuries and illnesses, \$22,275 can be attributed to the Uniprise business segment on an annual basis. In addition to the salary devoted to managing claims,

UnitedHealth Group also incurs the expense associated with the waiting period before indemnity benefits are allocated to the claim file. The waiting period varies by state however an average of three days was used to project associated costs based on the number of indemnity claims. For the year 2001, Uniprise experienced 46 indemnity claims. At an average daily wage of \$100, projected lost time costs associated with the waiting period were conservatively estimated at \$13,800. Lastly, there are three flat-rate fees associated with claims administration including a \$20 per claim intake fee, a \$90 per medical only claim fee, a \$925 per indemnity claim fee, and an annual \$9,600 general administrative fee. Using the 2001 fiscal year as an example, ancillary fees contributed an additional \$13,420 to the total cost of medical claims, \$44,712 to the total cost of indemnity claims and \$3,168 to general claims administration. Overall, an estimated \$97,375 in additional total administrative costs were added to the 2001 loss year to project ultimate claim costs at \$1,109,202.

Impact on Profitability. To translate the loss to Uniprise into business terms, the direct costs of occupational injuries and illnesses for the 2001 fiscal year were applied to the operating margin for 2001. At an operating margin of 15.2%, \$1,109,202 in loss would require an additional \$7,297,382 in revenue to compensate for the additional expense.

#### Cost-Benefit Analysis

Based on the number and cost of injuries within the Uniprise business segment, an ergonomic program was chosen as the proposed risk control intervention. The UnitedHealth Group cost-benefit analysis model was used to estimate the return on

investment of the ergonomic program by estimating the cost of the intervention, the savings associated with the intervention and calculating the internal rate of return.

Projected cost of intervention. The general procedure used to estimate the costs for the intervention was modeled after the Cost Benefit Analysis of the Ergonomic Standard prepared by the Washington Department of Labor and Industries (2002). The Washington State analysis included the following components to calculate the unit control cost by standard industrial code (SIC): (a) basic ergonomic education given to employees in the selected target population, (b) training for managers or supervisors conducting job analysis or hazard job training, (c) job analysis, (d) engineering and administrative controls to reduce related hazards, (e) protective equipment to reduce related hazards, and (f) managerial and administrative time required to oversee and evaluate the ergonomic program.

Based on the number and cost of cumulative trauma disorders, the Production and Service divisions of Uniprise were chosen as the target population for the risk control intervention, representing 6,192 employees. The Washington State analysis calculated the unit control cost by standard industrial code for each component of the program. Falling under SIC 6321, Table VI represents the unit control and total control costs of a related risk control intervention within the Production and Service divisions of Uniprise, based on projected key components.

Table VI

Key Component Unit Control Costs for Production and Service

Key Component	Cost per employee	Number employees	Total unit cost
Basic ergonomic education	\$12.96	6192	\$80,248
Train the trainer and job analyst training	\$1.25	6192	\$7,740
Job analysis costs	\$0.97	6192	\$6006
Engineering and administrative controls	\$8.10	6192	\$50,155
Protective equipment	\$0.51	6192	\$3,158
Managerial and administrative costs	\$2.44	6192	\$15,108
Total	\$15.20	6192	\$156,118

The Washington State elemental, cost estimates were annualized over 10 years for engineering and administrative controls and over 3 years for education and training costs.

A 5% discount rate was used in the process to discount future costs and benefits.

Training costs were estimated to occur in the first year and every three years thereafter.

Job analysis costs were applied over three years as were managerial and administrative costs. Engineering controls and protective equipment costs were allocated over three years with heavy emphasis on the first year of implementation. In addition to the

\$204,643 associated with the specific components of the intervention, it was assumed that training would be provided internally by UnitedHealth Group Risk Management, adding \$9,250 to the total cost of intervention (see Appendix A for project cost estimation).

Projected savings from intervention. Estimated savings or benefits associated with an ergonomic risk control intervention were also modeled in part after the Cost Benefit Analysis of the Ergonomic Standard conducted by the Washington Department of Labor and Industries in May, 2002. Projected savings were based on the impact on direct workers' compensation claim costs associated with the decrease in cumulative trauma disorders that are anticipated to follow the reduction or elimination of related hazards in the workplace. The value of lost output was limited to the average costs associated with workers' compensation claims based on developed data from the 2001 fiscal year as the most recent, whole year.

Based on an extensive literature search around the effectiveness of ergonomic interventions and the risk of injury from exposure to ergonomic risk factors, the Washington State Department of Labor estimates that compliance with the ergonomics rule will prevent 40% of workplace musculoskeletal injuries and 50% of related costs. As only certain elements of the rule were applied to the cost projection for Uniprise, more conservative estimates, a 25% reduction in the number of reported claims, and a 30% reduction in cost, were used to project the associated benefits. Based on the 2001 workers' compensation experience, the Production and Service divisions of Uniprise experienced 23 claims associated with cumulative trauma disorder accounting for \$287,809 of direct costs, including a 14% allocation of administrative costs, based on the number of reported claims. A related risk control intervention was projected to result in a

reduction of 6 injuries and \$86,343 in costs on an annual basis, based on percent of total costs. Based on the average cost of cumulative trauma disorder for 2001, \$23,440, the estimated cost reduction was measured at a more aggressive \$140,640. Estimated savings were projected over three years, resulting in total savings of \$259,029.

Return on investment. The UnitedHealth Group cost-benefit model was used to measure the net present value and the internal rate of return of the risk control initiative based on the estimated costs and savings. Assumptions included a 13% Discount Rate, a 38% Tax Rate, a three-year Tax Depreciation Life and a five-year Book Depreciation Life. Project costs were estimated to be \$213,893 over a three-year implementation period. Project savings were estimated to be \$259,029 over the same period. Based on the assumptions and the cost-benefit model, total Net Present Value of the risk control intervention was calculated at \$8,931 and the Internal Rate of Return was calculated at 28.87%. A positive Net Present Value and Internal Rate of Return indicated a positive return on investment (see Appendixes A and B for the detailed cost-benefit model).

## Results

Goal one. The first goal of this study was to conduct an analysis of Uniprise workers compensation claims to determine the distribution of claims and injury types and to quantify the costs associated with workers' compensation claims by predominant injury types and functional division. Uniprise workers' compensation claims data from 1999 through April 2002 was obtained and analyzed by (a) annual number of reported claims and cost, (b) annual number of reported claims and cost by functional division, (c) number of reported claims and cost by injury cause, (d) number and cost by injury cause and functional division, and (e) average cost of injury by claim type. Uniprise has



experienced a decrease in the the number of reported claims of claims since 1999 however cost has fluctuated annually. Cumulative trauma disorders contributed over 61% of the \$4,909,453 in total developed claims cost incurred since 1999. The Production and Service divisions within Uniprise contributed 44% of total occupational injury and illness reported and 58% of the total cost after development during the same time period.

In addition to costs reflected in the workers' compensation database, ancillary expenses associated with managing and administering the workers' compensation program were calculated, using 2001 as the most recent full year of claims. Additional costs allocated to the Uniprise 2001 loss year included \$22,275 in salary costs, \$13,800 in loss time costs, and \$61,300 in claims handling fees, totaling \$97,375, bringing the total cost of claims for the year to \$1,109,202.

Goal two. The second goal of this study was to quantify the operational impact of occupational injuries and illnesses by calculating the impact on profitability. Based on the 2001 operating margin of 15.2%, it was determined that an additional \$7,297,382 in revenue was required to compensate for losses incurred during that year.

Goal three. The final goal of this study was to estimate the costs and benefits associated with a risk control intervention and apply a financial model to project the anticipated return on investment. Costs and benefits of the ergonomic risk control intervention were estimated based on the Cost Benefit Analysis of the Ergonomic Standard conducted by the Washington Department of Labor and Industries in May, 2002. Total costs were estimated at \$213,893 while total benefits or savings were

estimated at \$259,029, resulting in a projected, positive return on investment when applied to the UnitedHealth Group Cost-Benefit Analysis model.

### Summary

The cost of occupational injuries and illnesses to the Uniprise business segment is sizable. On average, workers' compensation claims have cost Uniprise \$1,527,693 a year since 1999, translating to \$8,274,296 in annual replacement revenue required to compensate for the loss. The actual cost to Uniprise and UnitedHealth Group is actually even higher when ancillary expenses such as loss time and claims administrative fees are considered.

When applied to the UnitedHealth Group financial model, the costs and benefits of a risk control intervention to reduce the number and cost of employee injury and illness demonstrated a positive Net Present Value and Internal Rate of Return, indicating a financially feasible investment. The ultimate direct cost of occupational injuries and illnesses, the impact of related loss on profitability and the positive cost-benefit analysis can be used to develop a business case for a formal risk control intervention.

## Chapter 5

### Summary, Conclusions, and Recommendations

#### Summary

Problem. Given the focus on reducing operating expenses within UnitedHealth Group, the speculation of potential benefits associated with proposed risk control initiatives are insufficient to financially justify related interventions. While UnitedHealth Group does have a cost-benefit model used to justify capital expenditures, it has not been used as a formal system to cost-justify risk control initiatives. To effectively propose and gain support for a risk control initiative focused on the reduction of occupational injuries and illnesses associated with cumulative trauma within the predominant contributing business segment, Uniprise, it is necessary to first establish a clear, standardized method of quantifying the financial impact of injury. The estimated costs and benefits associated with a related risk control intervention must then be applied to a business-based cost-benefit model to determine the financial feasibility of implementation.

Purpose and goals of research. The purpose of this study was to develop a comprehensive, business-based cost impact analysis focused on cumulative trauma disorder that adequately represents the direct cost of injuries to Uniprise and can be used in conjunction with a cost-benefit model to determine the financial feasibility of a formal ergonomic intervention within the Production and Service divisions of Uniprise. The goals of this study were threefold:

1. Conduct an analysis of Uniprise workers compensation claims to determine the distribution and cost of claims and injury types as they relate to the

Uniprise business segment and to quantify the total direct costs associated with workers' compensation claims by predominant injury types and functional division.

2. Quantify the operational impact of occupational injuries and illnesses by translating costs into key operational standards within the Production and Service divisions of Uniprise and calculating the impact on profitability.
3. Estimate the costs and savings of a formal ergonomic intervention within the Production and Service divisions of Uniprise and apply those estimates to a cost-benefit model to project the return on investment.

Background and significance of research. Since 1999, Uniprise has contributed over 33% of the total workers' compensation claims that have occurred within UnitedHealth Group and over 41% of the total cost of claims, accounting for \$4,909,453 in direct costs. Of the total contribution, 36% of the total number reported and 44% of the severity can be attributed to cumulative trauma disorder, accounting for \$2,143,558 in direct costs. Two divisions within Uniprise, Production and Service, have contributed 45% of total claims and 51% of the total severity of injuries and illnesses, accounting for \$2,497,682.

The Production and Service divisions of Uniprise present significant risk factors for cumulative trauma disorder, most predominantly the highly repetitive nature of claims management and customer service activities. As Uniprise continues to refine its key business processes to reduce operating costs, fewer employees will be expected to contribute greater productivity, while maintaining or improving quality, further increasing the risk for injury.

The concept of defining and categorizing costs has evolved and become more diversified over the last several decades in an effort to more accurately quantify the impact of occupational injuries and illnesses. As key decision-makers within businesses respond to economic motivation, applying an operationally based economic cost structure to risk control allows risk control interventions to mirror the management decision-making process (Dorman, 2000).

Research design. The primary objective of this field problem was to translate the cost of occupational injury and illness into an operationally based, financial cost-benefit model that can be used to support risk control intervention within the Uniprise business segment of UnitedHealth Group. The methodology used to accomplish the objective included: (a) identifying and quantifying the historical distribution and cost of occupational injury and illness, (b) translating related costs into business-based economic measurement criteria to effectively define the impact on profitability, and (c) proposing a cost-benefit financial model to estimate the return on a risk control initiative. The Review of Literature helped to determine the scope of this study by analyzing the types of related costs to be considered, reviewing national databases for broader scope comparison and identifying various financial models to translate costs and benefits into business terms.

### Conclusions

Goal one. The first goal of this study was to conduct an analysis of Uniprise workers compensation claims to determine the distribution and cost of claims by predominant injury types and functional divisions. Uniprise workers' compensation claims data from 1999 through April 2002 was obtained and analyzed by (a) annual

number of reported claims and total cost, (b) annual number of claims and total cost by functional division, (c) annual number of claims and total cost by injury cause, (d) annual number of claims and total cost by injury cause and functional division, and (e) average cost of injury by claim type. Uniprise has experienced a decrease in the number of reported claims since 1999 however the cost of claims has fluctuated annually.

Cumulative trauma disorders were the leading cause of injury within Uniprise, contributing over 61% of the \$4,909,453 in total claims cost incurred since 1999. The Production and Service divisions within Uniprise contributed 44% of reported claims and 58% of the total cost after development during the same time period.

Given the absence of a formal risk control program within Uniprise, the reduction in total number of claims on an annual basis since 1999 cannot be attributed to proactive intervention. Based on the distribution and cost of claims by injury cause, I conclude that a risk control intervention focused on the reduction of cumulative trauma disorders within the Production and Service divisions of Uniprise would have the greatest impact on the reduction of costs associated with occupational injuries and illnesses.

In addition to costs reflected in the workers' compensation database, ancillary expenses associated with managing and administering the workers' compensation program were calculated, using 2001 as the most recent full year of claims. Additional costs allocated to the Uniprise 2001 loss year included \$22,275 in salary costs, \$13,800 in loss time costs, and \$61,300 in claims handling fees, totaling \$97,375, bringing the total cost of claims for the year to \$1,109,202.

For the year 2001, ancillary expenses as calculated in this study contributed almost 9% of the total cost of workers' compensation for Uniprise. This number is

underestimated in that certain unallocated expenses were excluded based on inability to attain and apportion. While ancillary expenses significantly contribute to the overall cost of workers' compensation, they are not currently included in UnitedHealth Group's cost allocation process. Therefore, it can be concluded that Uniprise is aware of, and financially responsible for, only a portion of the costs generated from occupational injuries and illnesses.

To expand further, only direct costs such as workers' compensation costs and administrative costs that were readily attainable and quantifiable were included in this study. A vast quantity of research supports that indirect costs such as lost production, employee turnover, replacement costs, etc., can far exceed direct costs. Based on supporting literature, I conclude that the costs as identified in this study are substantially underestimated.

Goal two. The second goal of this study was to quantify the operational impact of occupational injuries and illnesses by calculating the impact on profitability. Based on the 2001 operating margin of 15.2%, it was determined that an additional \$7,297,382 in revenue was required to compensate for losses incurred during that year.

While \$7,297,382 in additional revenue to compensate for Uniprise 2001 occupational injuries and illnesses is substantial, it does not adequately illustrate the impact on Uniprise operations. I found that as a service organization, Uniprise measures business impact in terms of productivity including number of calls serviced and number of claims paid in a specified time period. Therefore, I conclude that in addition to showing impact on revenue, the cost of occupational injuries and illnesses in terms of impact on productivity would provide a more meaningful measure.

Goal three. The final goal of this study was to estimate the costs and benefits associated with a risk control intervention and apply a financial model to project the anticipated return on investment. Costs and benefits of the ergonomic risk control intervention were estimated based on the Cost Benefit Analysis of the Ergonomic Standard conducted by the Washington Department of Labor and Industries in May, 2002. Total costs were estimated at \$213,893 while total benefits or savings were estimated at \$259,029.

Based on the positive return on investment resulting from the application of the UnitedHealth Group Cost-Benefit model, I conclude that a formal ergonomic risk control intervention would be a profitable investment for Uniprise.

### Recommendations

1. The Uniprise business segment of UnitedHealth Group should consider implementing a pilot ergonomic risk control intervention to target the reduction of the number and severity of occupational cumulative trauma disorders. While the cost-benefit analysis used in this study supports the implementation of a related risk control intervention, projected costs and benefits are based on research conducted by the Washington State Department of Labor rather than internal measures. A pilot program within Uniprise would allow a more accurate projection of the costs associated with implementation as well as the ultimate benefits derived from the intervention.

2. According to the research associated with quantifying loss, indirect costs can far exceed the direct cost of injury. In this study, the cost of occupational injury and illness was limited to direct costs associated with workers' compensation claims, significantly underestimating the total impact of loss. To accurately project the ultimate



costs associated with occupational injury and illness, indirect costs must be identified and quantified.

3. Sole use of the workers' compensation database information provides an inadequate representation of injury exposure and incidence. In this study, only those claims that incurred costs were used to analyze the cost of injury however on average, 62 zero-dollar incidents are reported each year. Additionally, many symptoms of cumulative trauma go unreported or are filed with personal health insurance providers. To obtain an accurate picture of loss exposure associated with cumulative trauma disorders, reported symptoms as well as short-term and long-term disability statistics must be considered.

4. The risk control benefits as projected in this study are underestimated in that they only consider reduction in the number and severity of related injuries. To accurately predict ultimate financial profitability associated with a specific risk control intervention, savings must be quantified in terms of bottom line dollars by considering impact on productivity, absenteeism and turnover. These statistics are can be captured through standard management systems.

5. The impact of injuries on Uniprise profitability was calculated using the operating ratio as the key financial indicator. To more specifically translate the bottom line impact of occupational injury and illness into business terms, costs should be related additional financial indicators, specific to the Production and Service divisions of Uniprise.

6. Currently, costs associated with occupational injuries and illnesses are allocated to business segments based on a historical three-year loss ratio and are limited

to the incurred direct costs as quantified in the workers' compensation database.

Administrative costs are considered overhead and are not allocated back to the segments.

More detailed accounting methods to capture direct and indirect cost information applied to a more thorough cost allocation system should be implemented to create more incentive to reduce costs through risk control.

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## Appendix A

### Summary of Project Costs

	Year 1								Year 2								Year 3								Year 1-3											
	Capitalizable				Expense				Total				Capitalizable				Expense				Total				Capitalizable				Expense				Total			
	hours	Travel	\$		hours	Travel	\$		hours	Travel	\$		hours	Travel	\$		hours	Travel	\$		hours	Travel	\$		hours	Travel	\$		hours	Travel	\$					
Internal FTE Resources																																				
UHG Corporate Risk Mgmt.	-	-	-	-	9,250	-	-	9,250	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9,250	-	-	9,250	-			
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
Uniprise Prog. Mgmt.	-	-	-	-	15,108	-	-	15,108	-	-	-	-	15,108	-	-	15,108	-	-	-	-	15,108	-	-	15,108	-	-	-	15,108	30,216	-	15,108	30,216	-			
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
Total Internal FTE Resources	-	-	-	-	24,358	-	-	24,358	-	-	-	-	15,108	-	-	15,108	-	-	-	-	15,108	-	-	15,108	-	-	-	24,358	30,216	-	24,358	30,216	-			
External Consulting																																				
Implementation Partner	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
Total External Resources	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
Training																																				
Job Analyst					7,740			7,740					-		-	-					-		-	-				7,740			7,740					
General Employee					80,248			80,248																				80,248			80,248					
Job Analysts					6,006			6,006					6,006			6,006					6,006			6,006				18,016			18,016					
					-			-					-		-	-					-		-	-				-		-	-	-				
					-			-					-		-	-					-		-	-				-		-	-	-				
Total Training					93,994			93,994					6,006			6,006					6,006			6,006				108,006			108,006					
Engineering Controls			39,985					39,985				9,996			9,996			3,332					3,332			53,313					53,313					
			-					-				-		-	-			-		-		-	-			-					-	-				
			-					-				-		-	-			-		-		-	-			-					-	-				
			-					-				-		-	-			-		-		-	-			-					-	-				
			-					-				-		-	-			-		-		-	-			-					-	-				
SUBTOTAL BEFORE MAINTENANCE	-	-	39,985	-	24,358	93,994	-	24,358	133,679	-	-	9,996	-	-	21,114	-	-	3,332	-	-	21,114	-	-	24,446	-	-	53,313	-	24,358	136,222	-	24,358	189,535			
Annual Maintenance																																				
Software Contract			-					-				-			-	-			-		-		-	-			-				-	-				
Internal			-					-				-			-	-			-		-		-	-			-				-	-				
TOTAL PROJECT HOURS/TRAVEL/COSTS	-	\$ -	\$ 39,985	-	\$ 24,358	\$ 93,994	-	\$ 24,358	\$ 133,679	-	\$ -	\$ 9,996	-	\$ -	\$ 21,114	-	\$ -	\$ 3,332	-	\$ -	\$ 21,114	-	\$ -	\$ 24,446	-	\$ -	\$ 53,313	-	\$ 24,358	\$ 136,222	-	\$ 24,358	\$ 189,535			

#### Summary:

Total Project Costs 2001-2003	
Excluding Maintenance	\$ 213,893
Including Maintenance	169,535
Total Project Costs 2001-2009	
Excluding Maintenance	
Gross Costs	213,893
NPV @ 13% Discount Factor	142,084
Including Maintenance - Gross Costs	213,893
Total Project Benefits 2001-2009 (net of maintenance costs)	
Gross Benefits	241,877
NPV @ 13% Discount Factor	151,015
NPV, Benefits net of Costs	8,931
Project IRR	28.87%



## Appendix B

## Total Project Costs

**Total Project Cash Basis - No Contingency**

	2001	2002	2003	2004	2005	2006	2007	2008	2009	Total
<b>Project Costs</b>										
Consulting (Capital)	-	-	-	-	-	-	-	-	-	-
Job Analysis	-	-	6,006	6,006	6,006	-	-	-	-	18,018
Equipment (Capital)	-	-	39,985	9,996	3,332	-	-	-	-	53,313
Other 1 (Capital)	-	-	-	-	-	-	-	-	-	-
Travel (Expense)	-	-	9,250	-	-	-	-	-	-	9,250
Training (Expense)	-	-	87,988	-	-	-	-	-	-	87,988
Project Management	-	-	15,108	15,108	15,108	-	-	-	-	45,324
<b>Total Cash (Out)</b>	-	-	<b>(158,337)</b>	<b>(31,110)</b>	<b>(24,446)</b>	-	-	-	-	<b>(213,893)</b>
<b>NPV at 0.13 =</b>	<b>(142,084)</b>									
<b>Benefits</b>										
SG&A Savings	-	-	-	-	-	-	-	-	-	-
Med Cost Savings	-	-	86,343	86,343	86,343	-	-	-	-	259,029
Interest Savings	-	-	-	-	-	-	-	-	-	-
On-Going Maintenance Costs	-	-	-	-	-	-	-	-	-	-
Tax effect (see below)	-	-	15,707	(19,217)	(18,034)	3,210	1,183	-	-	(17,152)
<b>Total Cash Savings</b>	-	-	<b>102,050</b>	<b>67,126</b>	<b>68,309</b>	<b>3,210</b>	<b>1,183</b>	-	-	<b>241,877</b>
<b>NPV at 0.13 =</b>	<b>151,015</b>									
<b>Total NPV =</b>	<b>8,931</b>									
<b>Net Cash in (out)</b>	-	-	<b>(56,287)</b>	<b>36,016</b>	<b>43,863</b>	<b>3,210</b>	<b>1,183</b>	-	-	<b>27,984</b>
<b>IRR</b>	<b>28.87%</b>									
<b>Tax Effect</b>										
Expense and Benefits	-	-	26,003	(71,235)	(71,235)	-	-	-	-	(116,467)
Tax Depreciation - Capital	-	-	15,330	20,664	23,777	8,447	3,113	-	-	71,331
<b>Total</b>	-	-	<b>41,333</b>	<b>(50,571)</b>	<b>(47,458)</b>	<b>8,447</b>	<b>3,113</b>	-	-	<b>(45,136)</b>
<b>Tax impact at EFT of 38.0%</b>	-	-	<b>15,707</b>	<b>(19,217)</b>	<b>(18,034)</b>	<b>3,210</b>	<b>1,183</b>	-	-	<b>17,152</b>